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TELEPHONE SERVICE WITH VARIABLE PARTY BILLING

BACKGROUND OF THE INVENTION

1. Technical Field:

The present invention is directed generally toward administering a mobile telephone service. More specifically, the present invention is directed toward allowing a change in the billed party in a mobile telephone call.

2. Description of Related Art:

The mobile telephone has ushered in a new era in interpersonal communications. While the late 1990s' widespread consumer interest in the Internet made ours a wired world, technical advances and increased consumer appeal are ushering in a new "wireless world." A number of mobile telephone manufacturers and service providers cater to a growing base of mobile telephone subscribers. Unlike most local telephone service in the United States, but akin to long-distance service, mobile telephone service is usually billed in minutes of airtime. That is, the amount a customer is charged is proportional to the amount of time spent in mobile telephone calls. For instance, a five minute call will usually cost five times as much as a one minute call. Unlike with long-distance service, however, airtime is generally billed to the customer regardless of whether the customer placed or received the call.

Because having every minute of every call charged for is a major discouragement to consumers wishing to use mobile telephones, mobile service providers often employ a

billing system in which customers pre-pay for a certain number of minutes of airtime each month. When a customer makes a call, the minutes of airtime are subtracted from the customer's balance of minutes for the month. Any additional minutes exceeding the customer's pre-paid balance are billed for separately. In most billing schemes, the current month's minutes expire at the end of the month if not used.

Thus, many mobile telephone customers pay for their telephone usage by redeeming pre-paid credits (measured in minutes of airtime). This scheme has many analogs in other areas of business. For instance, most individuals will mail a letter by first buying a pre-paid postage credit (i.e., a postage stamp), then redeeming the credit (i.e., mailing the letter with the stamp attached). Nonetheless, the problem of billing mobile telephone customers for the calls they receive remains. The fact that a caller knows that the party she is calling will be charged for the call can be a major discouragement to calling that person's mobile telephone number. Likewise, someone who has asked a mobile telephone user to call him may wish to be billed for the caller's airtime, rather than make the caller pay for a call the called party requested. Thus, it would be beneficial if there were a way for a party to a mobile telephone conversation to be billed for the entirety of the airtime.

SUMMARY OF THE INVENTION

The present invention provides a method, computer program product, and data processing system for specifying a party to be billed for the entirety of mobile telephone airtime and other charges in a telephone conversation. Either the caller or a called party may accept all airtime and/or other charges. In addition, the parties need not operate a mobile telephone, but may use a conventional "wire" telephone.

BRIEF DESCRIPTION OF THE DRAWINGS

The novel features believed characteristic of the invention are set forth in the appended claims. The invention itself, however, as well as a preferred mode of use, further objectives and advantages thereof, will best be understood by reference to the following detailed description of an illustrative embodiment when read in conjunction with the accompanying drawings, wherein:

Figure 1A is a diagram of a mobile telephone with which the processes of the present invention may be implemented;

Figure 1B is a block diagram of a mobile telephone with which the processes of the present invention may be implemented;

Figure 2 is a diagram of the operation of a mobile telephone system in which the present invention may be implemented;

Figure 3 is a block diagram of a data processing system in which the processes of the present invention may be executed;

Figure 4 is a diagram of a database holding information about mobile telephone subscribers in a preferred embodiment of the present invention;

Figure 5 is a diagram of a process of specifying the party to be billed for mobile airtime minutes in accordance with a preferred embodiment of the present invention;

Figure 6 is a flowchart representation of a process of specifying a billed party in accordance with a preferred embodiment of the present invention;

Figure 7 is a diagram depicting a process of accepting airtime charges in a call in progress; and

Figure 8 is a flowchart representation of a process for accepting airtime charges for a call in progress.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Figure 1 depicts an exemplary mobile telephone **100** with which the processes of the present invention can be implemented. Mobile telephone **100**, for instance, could be a Talkabout® T8167 Mobile Telephone from Motorola, Inc. of Schaumberg, Ill. Like a conventional telephone, mobile telephone **100** contains an earpiece **102**, a microphone **104**, and a keypad **106** for emitting DTMF (Dual-Tone Multiple Frequency) tones for dialing. Mobile telephone **100**, unlike a conventional telephone, uses an antenna **108** as its communications link to the Public Switched Telephone Network (PSTN), the standard public telephone network through which most telephone calls are routed. Mobile telephone **100** may transmit and receive data, including but not limited to voice data, through an analog-coded or digitally coded signal. One common communications standard for mobile telephones is the PCS (Personal Communications Services) standard, which uses digital signal coding. Some mobile telephones, such as dual-band mobile telephones, will allow multiple communications standards to be used with the same telephone; this is a convenience, particularly in remote areas where some communications protocols are not available.

Mobile telephone **100** includes a "send" button **110** and an "end" **112** button for initiating and terminating calls, respectively. To dial another telephone, a user enters the telephone number for that telephone on keypad **106** and

presses "send" button **110** to place the call. To "hang up" or terminate the call, the user presses "end" button **112**.

Mobile telephone **100** also includes a liquid-crystal display (LCD) **114** for indicating to a user the status of mobile telephone **100**, such as when mobile telephone **100** is dialing. In some mobile telephones, display **114** may be used for executing software, such as games, or for browsing World Wide Web documents loaded from the Internet through a wireless connection using antenna **108**. A user of mobile telephone **100** will generally rely on a service provider to provide a wireless gateway into the PSTN. In addition to allowing a user to send and receive telephone calls, a service provider may provide additional features to customers. One of these features, as was already mentioned, is wireless Internet access. Another is voice mail. If the user of the mobile telephone **100** is unavailable (i.e., has turned off mobile telephone **100**, is already talking to someone using mobile telephone **100**, or simply ignores the ringing mobile telephone **100**), a caller calling mobile telephone **100** can be switched into a voice mail service, where the caller can leave a message for the user of mobile telephone **100**. An indicator, such as an envelope icon, can appear in display **114**. The user of mobile telephone **100** can later access the voice mail service by pressing a special voice-mail button **116** or by calling a special telephone number (such as *123, for instance) or by calling the user's own number. The user can then use keypad **106** to enter DTMF tones to select recited voice mail menu options.

Mobile telephone **100** will generally run on some kind of battery power using a rechargeable battery pack, or the like. To conserve energy when mobile telephone **100** is not needed, power button **118** may be used to turn off and later turn on mobile telephone **100**. When mobile telephone **100** is turned off, it cannot send or receive calls, although voice mail services are still available. **Figure 1B** is a block diagram of mobile telephone **100**. Bus **120** provides the central backbone through which the electronic components of mobile telephone **100** communicate.

Attached to bus **120** is a communications circuitry module **122**, which transmits and receives mobile telephone signals through antenna **124** using one of a number of transmission and multiplexing schemes available for wireless communications including, but not limited to, FDMA (frequency division multiple access), TDMA (time division multiple access), CDMA (code division multiple access), and GSM (global system for mobile communications).

Communications circuitry module **122** and other components of mobile telephone **100** are controlled by processor **126** which may be a general-purpose microprocessor, such as a PowerPC microprocessor, or a digital signal processor or other specialized processor. Processor **126** executes program code stored in memory **128** to direct the operation of mobile telephone **100**. Processor **126** also uses memory **128** to store data, such as frequently-dialed telephone numbers.

A variety of input-output (I/O) components communicate with processor **126** through bus **120**, including keypad **130** and liquid-crystal diode (LCD) display **132**. Analog-to-digital converter **134** takes analog audio information from microphone **136** and converts it to a digital data representation for transmission over bus **120**. Likewise digital-to-analog converter **138** takes digital data from bus **120** and converts it into audio for presentation through earpiece speaker element **140**. All of these I/O components communicate with and are coordinated by processor **126**. For example, digital audio data created by analog-to-digital converter **134** is retrieved by processor **126**, prepared for transmission by processor **126**, and then sent to communications circuitry module **122** for transmission over antenna **124**. To take another example, a telephone number entered by a user using keypad **130** is retrieved by processor **126**, which generates DTMF tones for transmission by communications circuitry module **122**. Processor **126** then displays the entered telephone number on LCD display **132** to the user.

Figure 2 is a diagram depicting the operation of a mobile telephone **202** within a telephone system **200**. Mobile telephone **202** communicates with radio tower **204**, sending and receiving voice and other data, such as Internet data. Service provider facility **206** connects control tower **204** with Public Switched Telephone Network (PSTN) **208**. Service provider facility **206** also performs such tasks as recording the number of minutes mobile telephone **202** stays connected on a call and providing voice mail and Internet services.

PSTN **208** connects service provider facility **206** with other communications devices such as telephones **210** and **212** and (by way of a service provider and radio tower) mobile telephone **214.** One of ordinary skill in the art will recognize that many communications devices that are not telephones may be connected to PSTN **208** and thus accessible by mobile telephone **202.**

One of ordinary skill in the art will also recognize that multiple service providers may be present within the same geographic area. In the diagram, service provider facility **209** represents an additional service provider in competition with the operators of service provider facility **206.**

Figure 3 is a block diagram of a data processing system **300** in which the processes and computer program product instructions of a preferred embodiment of the present invention may be implemented. Preferably data processing system **300** will be associated with equipment operated by a mobile telephone service provider. For example, data processing system **300** may be associated or located in service provider facility **206** in **Figure 2.**

Data processing system **300** includes a (central) processing unit **302** connected to a local bus **304.** Processing unit **302** executes instructions stored in memory **306,** which is also connected to local bus **304.** Processing unit **302** may comprise a single processor, such a microprocessor, or it may comprise multiple processors so as to allow the execution of multiple instructions simultaneously. Any number of processors could be used

in processing unit **302**. An example of a suitable processor is the PowerPC microprocessor, developed by IBM Corporation of Armonk, New York.

Many different types of memory are available and suitable for use within data processing system **300**. Memory is generally classified as volatile and non-volatile memory. Volatile memory types store data temporarily while the data processing system is operating, but lose their data once the data processing system's power is turned off. Most volatile memory in use today is "random access memory," (RAM) meaning that data and instructions may be read from or written to any portion of the memory at any time. Common random access memory types well-known to those skilled in the art include static random access memory (SRAM) and dynamic random access memory (DRAM). Non-volatile memory types retain their information, even when the data processing system is turned off. Non-volatile memory types are generally referred to as "read-only memories" (ROM). Many types of non-volatile memories exist. Programmable read-only memory (PROM) may be programmed with permanent data using a PROM programming device. Erasable programmable read-only memory (EPROM) can be erased of its data contents, through such means as ultraviolet radiation or through electric current (as with an electrically-erasable PROM or EEPROM). Flash memory and non-volatile random-access memory (NVRAM) are two memory media that may be written to and erased within working circuits without the use of a memory programming device.

Memory **306** may store data to be operated upon by processing unit **302**, it may store instructions to be executed by processing unit **302**, or it may store both.

In **Figure 3**, a single memory module is depicted, although many memory arrangements are possible. Cache memory, which is a high speed memory used for temporary storage of data and instructions to be stored to read from a primary bank of memory may be used. Also, certain systems designed with what is known as a "Harvard architecture" use separate memory and buses for data and instructions.

PCI bus bridge **308** connects local bus **304** to PCI input/output (I/O) bus **310**. PCI I/O bus **310** is what is known as a backplane bus. A backplane bus is not connected directly to a central processing unit, but communicates with the central processing unit via a bus bridge. Peripheral devices, such as disk drives and other input/output and storage devices typically connect to backplane buses. Having a separate backplane bus prevents peripheral device malfunctions from interrupting the operation of the central processing unit (processing unit **302**).

Secondary storage **312** is connected to PCI I/O bus **310**. Secondary storage **312** may comprise one or more disk drives, magnetic tape drives, optical storage devices, or other persistent storage medium. Secondary storage **312** preferably stores relatively large amounts of data and instructions compared to memory **306**. Secondary storage **312** may be used for permanent storage of data or instructions, such as a database, or secondary storage **312** may be used to supplement memory **306** with additional storage space. One common method of providing additional storage space to augment memory **306**, called virtual memory, involves swapping portions of data, called pages, between memory **306** and secondary storage **312** such that

pages are addressed and located in memory **306** when in use, but swapped out to secondary storage **312** when not in use. Also connected to PCI I/O bus **310** is a telephone interface device **314**. Telephone interface device **314** includes a PCI I/O adapter **316** connected to PCI I/O bus **310**. PCI I/O adapter **316** allows telephone interface device **314** to communicate through PCI I/O bus **310**. PCI I/O adapter **316** is connected to telephone interface system bus **318**, which connects the various components of telephone interface device **314**. An embedded processor **320** is preferably some sort of microprocessor, such as a Z80 microprocessor, manufactured by Zilog, Inc. Embedded processor **320** executes instructions stored in memory **322**, which is also attached to telephone interface system bus **318**. Embedded processor **320** interprets commands communicated through PCI I/O adapter **316** and, in response, directs the operation of telephone interface device **314**. Embedded processor **320** operates on data, which it stores and retrieves in memory **322**. Alternatively, a microcontroller, such as an 8051 microcontroller, manufactured by Intel Corporation, could be used in place of embedded processor **320** and memory **322**. A microcontroller is a monolithic integrated circuit containing both a processor unit and memory. Dual Tone Multiple Frequency (DTMF) decoder **324** interprets DTMF tones from telephone network line **326**, translating the tones into corresponding numbers from a telephone keypad. DTMF decoders are available as monolithic integrated circuits from a number of vendors.

DTMF decoder **324** reports the numeric interpretation of the DTMF tones to embedded processor **320** through telephone interface system bus **318**.

Telephone network line **326** can be connected directly into the Public Switched Telephone Network, perhaps using a DSL (Digital Subscriber Line) modem. It may also be connected through a local-area network (LAN) using, for example, an RJ45 modular connector for an Ethernet LAN, perhaps connected to a T1 line (a high-bandwidth network line). Although a standard analog telephone line may be used, a more likely option would be utilize a digital telephone line instead.

Telephone line control system **329** acts under the control of embedded processor **320** to "pick up" or "hang up" telephone network line **326**. Telephone line control system **329** also detects when telephone network line **326** is "ringing."

Embedded processor **320** transmits audio messages across telephone network line **326** by transmitting digital audio data (which may include voice, indicator chimes, DTMF signals, or any other audio signal) from memory **322** through communication module **330**.

Figure 4 is a diagram depicting the format of a account information database stored within secondary storage **312** of **Figure 3** in a preferred embodiment of the present invention. Table **400** includes entries **402** for each of the customers of a mobile telephone service provider. Account holder field **404** stores the name or identity of each customer. Account number field **406** stores an account number for each customer, which may the customer's telephone number. Minute balance field **408**

stores each customer's balance of remaining call minutes. Table **414** stores entries for another telephone company, which may or may not be a mobile telephone customer. The present invention provides a method, computer programming product, and apparatus for changing the billing of airtime minutes for a call from one billed party to another. In a preferred embodiment, for instance, the mobile telephone customer whose entry is **410** may be engaged in a telephone conversation with a telephone customer who is using a different telephone service provider (**414**) and whose entry is **416** (the customer in entry **416** need not be a mobile telephone customer). The customer in entry **416** may accept the airtime or other charges for the customer in entry **410** in addition to any charges the customer in entry **416** may incur for the call; thus, entry **416** will have airtime minutes deducted from entry **416**'s balance of remaining minutes to pay for the telephone charges of the customer in entry **410**. Other charges, such as long distance charges or local telephone provider charges may be accepted on behalf of another party as well.

Note that **Figure 4** depicts a pre-paid billing arrangement. The processes of the present invention are equally applicable when a customer accrues charges and pays them off after they have accrued. In such a case, instead of a minute balance being deducted from, an accounts receivable figure will be incremented.

Figure 5 provides a story board representation of a process of a caller accepting the called party's airtime charges in a preferred embodiment of the present invention. Note that although the caller in **Figure 5** is

using a mobile telephone, only the called party need be using a mobile telephone; the caller may use any type of telephone. In step **502**, the customer transferring the minutes dials a telephone number or access code (such as *123) for the variable billing function, on keypad **504**. Then the customer presses "Send" button **506** to initiate a call to the service. A call is connected to data processing system **300**, as described in **Figure 3**. In step **508**, data processing system **300** answers the call and plays a recorded message through digital to analog converter **330**, asking for the called party's telephone number.

In step **510**, the customer enters the recipient's telephone number and the "#" (pound) key on keypad **504**, which causes DTMF tones to be produced and transmitted to data processing system **300**. Data processing system **300** then decodes the DTMF tones to recover the entered digits. Next, in step **512**, the customer is given a confirmation message telling that the caller will be billed for the called party's airtime. Finally, in step **514**, the call is connected.

Figure 6 is a flowchart representation of a process of a caller accepting the airtime charges for the called party in a preferred embodiment of the present invention. First, a call to mobile phone service provider equipment is received (step **600**). The called party's telephone number is received (step **602**). Then, the call is placed and the called party is notified that the call will be paid for by the caller, perhaps with an indicator associated with caller ID (step **604**). The call is terminated at the end of the conversation (step **606**).

Finally, customer records are updated to reflect that the caller has been billed for the call (step **608**). **Figure 7** is a diagram depicting a party to a conversation's acceptance of the other party's airtime charges. In step **700**, the accepting party carries on a conversation with another party; the other party is talking on a mobile telephone. In step **702**, the accepting party presses a key on telephone keypad **704**(in this case, "#" key **706**), which signals the accepting party's telephone service provider to allow the accepting party to assume the airtime charges for the other party. In step **708**, a chime is played over the earpiece of the telephone and is audible to both parties to signify that the accepting party has accepted the other party's airtime charges. Note that the accepting party need not be using a mobile telephone.

Figure 8 is a flowchart representation of a process of accepting airtime charges for another party in accordance with a preferred embodiment of the present invention. First, the parties must be in communication with one another (step **800**). Next, the accepting party actuates a control on his or her telephone to signify that the accepting party wishes to assume the airtime and/or other charges (step **802**). A confirmation is presented to the parties (step **804**). The billing records are updated to show that the accepting party has accepted the already accrued charges, and as the call transpires, the records continue to be updated so as to bill the accepting party for the entirety of the call (step **806**). Finally, the call terminates (step **808**).

One of ordinary skill in the art will recognize that a number of variations of the present invention exist. For

instance, one particularly useful feature that could be added to the embodiment herein described would be a notification to the non-billed party that the billed party has accepted all airtime charges. The notification may be as simple as a chime played in the earpiece of the non-billed party's telephone. It may be a text message or icon transmitted and displayed on display **114** (**Figure 1**) along with the billed party's telephone number or sent via instant messaging for example.

The variable party billing service need not be free of charge. Mobile telephone service providers could charge a transaction fee for overriding the default billing. They could also offer the ability to make (free or for fee) billing overrides as a premium telephone service.

Another possible variation on the present invention involves billing arrangements between customers having different telephone service providers. Service providers would enter into reciprocal agreements to allow billing overrides with different service providers. Service providers would agree to exchange rates, wherein airtime minutes from one service provider would have a relative value vis-à-vis services or features from another service provider. For example, two service providers (A and B) may agree to allow billing overrides between the two service providers with an exchange rate of 3 minutes of A for every 2 minutes of B. Accordingly, a customer of B could be billed for 100 minutes of airtime by a customer of A. The customer of B would then be billed for only 67 minutes, due to the exchange rate between A and B.

Another variation involves no affirmative act to change the billed party. Much like toll-free numbers (e.g., "1-800 numbers" in the United States), dedicated

free-airtime telephone numbers can be established, whereby anyone who calls one of these free-airtime telephone numbers will have his or her airtime billing and/or other charges assumed by the holder of the free-airtime number. The holder of a free-airtime telephone number could either be billed for the actual airtime or billed at a flat periodic (e.g., monthly) rate for the use of a free-airtime number.

It is important to note that while the present invention has been described in the context of a fully functioning data processing system, those of ordinary skill in the art will appreciate that the processes of the present invention are capable of being distributed in the form of a computer readable medium of instructions and a variety of forms and that the present invention applies equally regardless of the particular type of signal bearing media actually used to carry out the distribution. Examples of computer readable media include recordable-type media, such as a floppy disk, a hard disk drive, a RAM, CD-ROMs, DVD-ROMs, and transmission-type media, such as digital and analog communications links, wired or wireless communications links using transmission forms, such as, for example, radio frequency and light wave transmissions. The computer readable media may take the form of coded formats that are decoded for actual use in a particular data processing system.

The description of the present invention has been presented for purposes of illustration and description, and is not intended to be exhaustive or limited to the invention in the form disclosed. Many modifications and variations will be apparent to those of ordinary skill in the art. The embodiment was chosen and described in

order to best explain the principles of the invention, the practical application, and to enable others of ordinary skill in the art to understand the invention for various embodiments with various modifications as are suited to the particular use contemplated.